Jill's Solutions

1. Read Burton §3.1. Summarize the **historical** topics discussed in these sections using at most two sentences.

   This section describes the evolution and expansion of the Greek culture throughout the Mediterranean during roughly the period from 800-600 BC. It emphasizes that the spread-out geography and improvements in writing language contributed to a political and intellectual system in which power and knowledge were more diffuse and less concentrated when compared to say earlier Egyptian ones.

2. Read Burton §3.2. Summarize the **historical** topics discussed in these sections using at most two sentences.

   This sections mostly discusses the nature of the cult of Pythagoras and its substantial and long-lasting influence of mathematics and eduction, including the rough framework for what we call today a liberal arts education.

3. Provide biographical details about Thales of Miletus

   (a) time: 622-547 BC

   (b) location: Miletus in Ionia (now Turkey)

   (c) list three mathematical accomplishments attributed to Thales. (Many choices here!)

     • Introduction of logical formal proofs
     • Many geometric facts such as the ratio of sides of similar triangles are equal and the opposite angles of intersecting straight lines are equal
     • Using similar triangles to solve practical problems such as the height of objects or distance of ships at sea.

4. Provide biographical details about Pythagoras of Samos

   (a) time: 585-500 BC

   (b) location: Born in Samos in Ionia. Travelled around the Mediterranean. Set up up school in Croton in present day Italy.

   (c) list three mathematical accomplishments attributed to Pythagoras
     • Some elementary number theory
     • The square root of 2 is irrational
     • The Pythagorean Theorem

5. A tall spruce tree stands in the yard of a house.

(a) Describe a strategy for determining the height of the tree analagous to that Thales used to determine the height of the Great Pyramid. Pick your own sample numbers to illustrate.

On a sunny day, have my 6 foot tall husband stand and I measure his shadow to be 5 feet long. At that same time, I measure the shadow of the tree to be 35 feet long. Using similar triangles and h to represent the height of the tree, we know $\frac{h}{35} = \frac{6}{5}$ or $h = 42$ feet.

(b) What assumption are **implied** in the algorithm used in part (a).
That the ground is level and the tree is growing orthogonal to the ground.

6. The symbols t_n and s_n are introduced on page 95.

(a) What do these symbols represent?

Specific figurative numbers: triangular and square numbers respectively.

(b) It is true that $t_n = 1 + 2 + \cdots + n$ and that $1 + 2 + \cdots n = \frac{(n+1)n}{2}$.

   i. What technique would a modern mathematics student use show the second equality above? (Indeed you probably proved this in Introduction to Proofs or Discrete Math.)

    Mathematical induction.

   ii. What is a reasonable guess about how the Pythagoreans deduced that equality?

    Pictures made of dots rearranged in various ways.